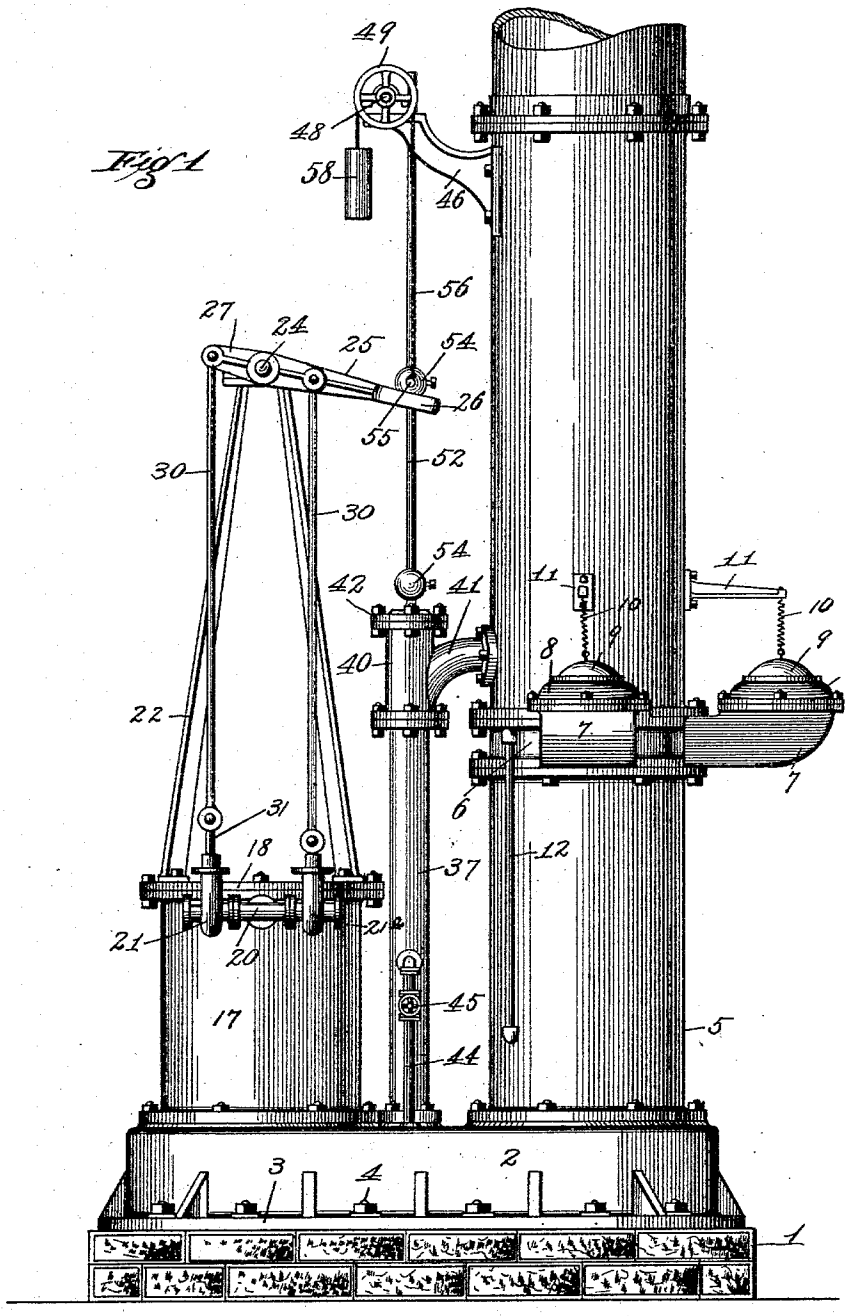
(No Model.) 3 Sheets—Sheet 1.

E. WITTMANN.

AIR COMPRESSOR.

No. 548,493. Patented Oct. 22, 1895.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

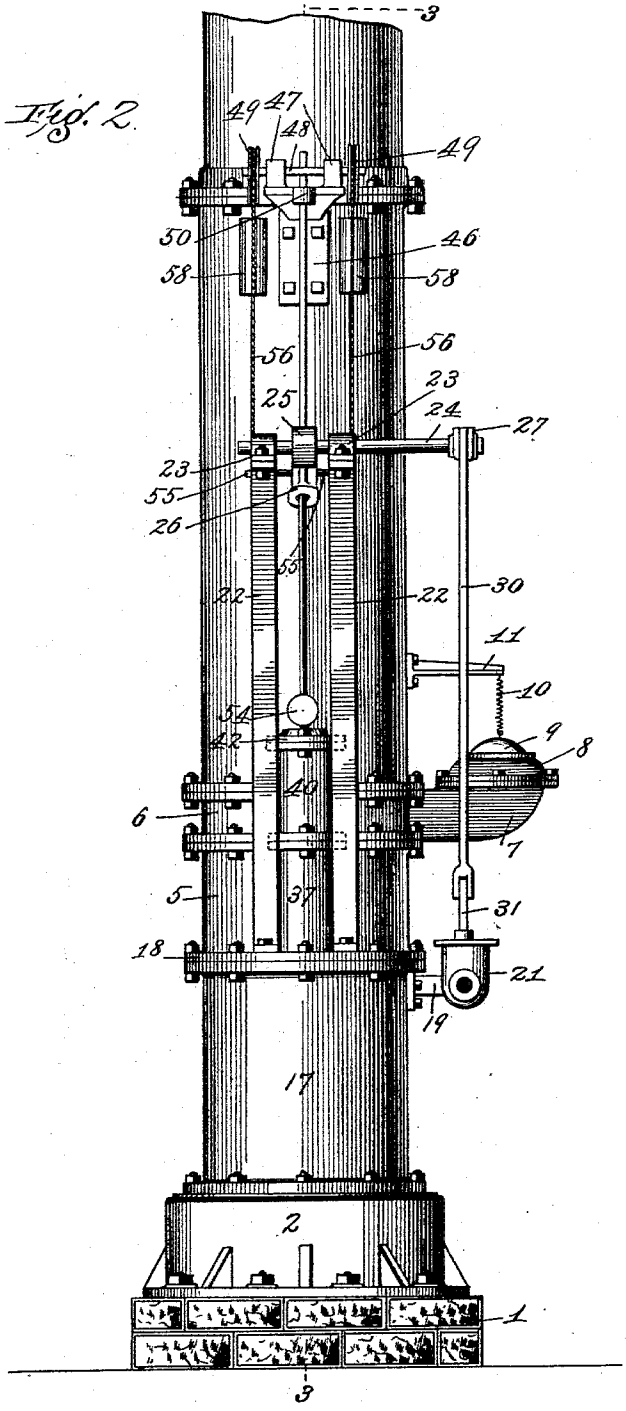

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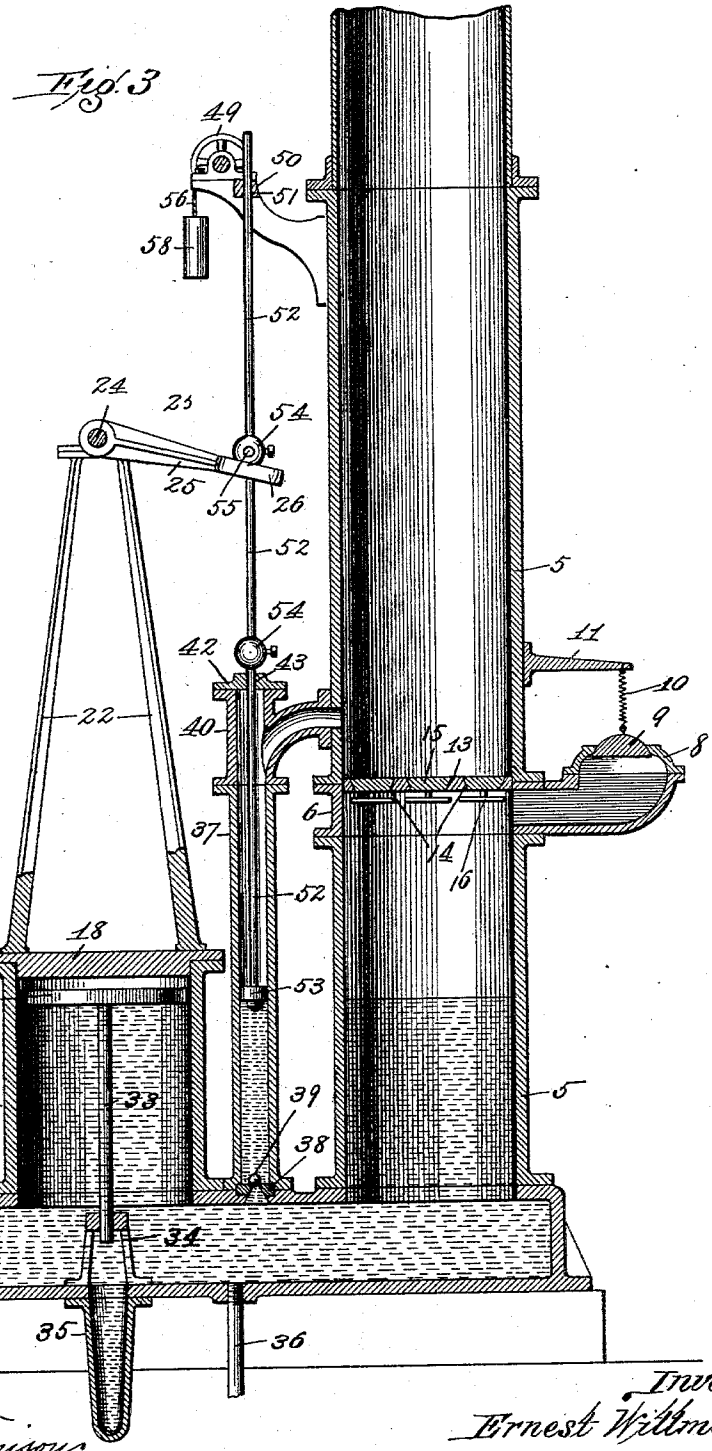
Fig. 3



Attest.
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UNITED STATES PATENT OFFICE.

ERNEST WITTMANN, OF MONTEREY, MEXICO.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 548,493, dated October 22, 1895.

Application filed May 13, 1895. Serial No. 549,120. (No model.)

To all whom it may concern:

Be it known that I, ERNEST WITTMANN, of the city of Monterey, Republic of Mexico, have invented certain new and useful Improvements in Air-Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved air-compressor; and it consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

In the drawings, Figure 1 is a front elevation of my improved air-compressor. Fig. 2 is an end elevation thereof. Fig. 3 is a vertical sectional view taken approximately on the indicated line 3 3 of Fig. 2.

Referring by numerals to the accompanying drawings, 1 indicates a suitable concrete or stone foundation, and upon said foundation is located a hollow base 2, which is preferably oblong and provided with a base-flange 3, through which pass bolts 4, that are embedded in the foundation 1. To the right hand and on top of this hollow base 2 is bolted the lower end of a vertically-arranged cylinder 5. This cylinder 5 is preferably constructed in sections and may be made of any height desired. Located in said cylinder 5 a suitable distance above the hollow base 2 is a section 6, with which are formed integral laterally-projecting elbows 7, to the tops of which are bolted annular caps 8, the same being fitted with hemispherical air-inlet valves 9, said valves being kept normally closed by being secured to the lower ends of retractile coil-springs 10, the upper ends of which are secured to brackets 11, bolted to and protruding laterally from the cylinder 5.

A water-gage 12 is fitted in the usual manner to the exterior of the cylinder 5 and extends vertically from the section 6 to a point near the base of said cylinder.

Horizontally and transversely arranged within the cylinder 5 in approximately the same planes as are the tops of the elbows 7 is a partition 13, in which is formed a series of apertures 14, the edges of which are inclined and perform the function of seats for check-valves 15. Wings 16 depend from the under sides of said check-valves 15 and prevent said valves from being displaced, said wings 16 not being wide enough to close the aperture 14 when said check-valves are in elevated positions.

Arranged upon the left-hand end of the hollow base 2, bolted thereto, and extending forwardly therefrom is a cylinder 17, approximately of the same diameter as is the cylinder 5. Said cylinder 17 is somewhat shorter than is the first section of the cylinder 5, and said cylinder 17 is closed at its upper end by a plate 18. Communicating with the interior of the upper end of this cylinder 17 is a short horizontal pipe 19, that connects with a horizontally-arranged pipe 20, and on each end of said pipe 20 are arranged inlet and exhaust valves, indicated, respectively, by the numerals 21 and 21ª. Suitable pipe connections are made to these inlet and exhaust valves.

Bolted to the top plate 18 and extending upwardly therefrom is a pair of skeleton frames 22, in the upper ends of which are formed journal-bearings 23. A shaft 24 is mounted for rotation in these journal-bearings 23, and upon said shaft 24, between said journal-bearings 23, is fixed an arm 25. This arm extends toward the cylinder 5, and the outer end 26 thereof is bifurcated. Fixed upon the outer end of the shaft 24 is an arm 27 in the form of an ordinary walking-beam.

30 indicates connecting-rods, the upper ends of which are secured to each end of the arm 27, and the lower ends of these connecting-rods 30 are pivotally attached to the upper ends of the valve-stems 31 of the inlet and exhaust valves 21 and 21ª.

When steam is used as a motive power, a float 32, that performs the function of a piston, is arranged to move vertically within the cylinder 17, and fixed to and depending from the under side of said float is a guide-rod 33, that passes through a bracket 34, fixed on the bottom of the hollow base 2. A casing 35 depends from the under side of this hollow base 2 and allows the guide-rod 33 to move downwardly as the float is moved downwardly. An inlet-pipe 36 discharges into the hollow base 2. Bolted to the top of the base 2, between the cylinders 17 and 5, is a cylinder 37, which is much smaller in diameter than is either of the cylinders 5 and 17. Arranged in the lower end of this cylinder 37 is a valve-seat 38, on which normally rests a ball-valve

39. The upper end of this cylinder 37 is in the same horizontal plane with the top of the section 6, and bolted to the top of said cylinder 37 is a section 40, with which is formed integral an elbow 41, that communicates with the interior of the cylinder 5 above the partition 13. The top of this section 40 is closed by a cap 42, in the center of which is formed a vertical aperture 43. Leading from the front of the cylinder 37, at a point slightly below the center thereof, to the hollow base 2 is a pipe 44, in which is located a check-valve 45. Bolted to the side of the cylinder 5, a suitable distance above the upper end of the cylinder 37, is a bracket 46, on the upper end of which is located a pair of horizontally-aligned journal-bearings 47, and in said journal-bearings is mounted for rotation a shaft 48. Mounted on the end of this shaft 48 are grooved wheels 49.

Formed integral with the bracket 46, between the journal-bearings 47, is a guide 50, provided with a vertically-arranged aperture 51, that is in direct vertical alignment with the aperture 43 in the cap 42. Arranged to operate through this guide 50 and through the cap 42 and the upper end of the cylinder 37 is a rod 52, the same having fixed on its lower end a piston 53. This rod 52 passes directly through the bifurcated end 26 of the arm 25, and vertically-adjustable balls 54 are arranged upon said rod 52 above and below said bifurcated end 26. The upper one of said balls is provided with integral horizontally-extending arms 55, to which are secured the lower ends of cables 56, that extend upwardly over grooved wheels 49 and have attached to their free ends weights 58.

The operation of my improved compressor when steam is used as a motive power is as follows: Through the inlet-pipe 36 water is discharged into the hollow base 2, and from said hollow base said water fills the lower ends of the cylinders 5 and 37 and nearly fills the cylinder 17, a slight space being left in the upper end of said cylinder 17 between the float 32 and the top plate 18. The height of the water in all the cylinders will be the same, and said height may be observed through the gage 12. When the arm 27 is in a horizontal position, both the inlet and exhaust valves 21 and 21ª are closed, and then the upper one of the balls 54 on the rod 52 moves the bifurcated end 26 of the arm 25 downwardly and rocks the shaft 24. Said arm 27 will be slightly rocked and the connecting-rods 30, following the movement of said arm 27, will open the inlet-valve 21 and close the exhaust-valve 21ª. Steam entering through said open inlet-valve 21 will enter the chamber in the upper end of the cylinder 17 above the float 32. The steam, acting in the usual manner, will drive the float 32, which now performs the function of a piston, downwardly, and necessarily the water within said cylinder 17 will be displaced and the water within the cylinders 5 and 37 will rise. As the water in the cylinder 5 rises the air between said water and the partition 13 will be forced upwardly and compressed until the pressure is great enough to raise the valves 15 and pass into the cylinder 5 above said partition 13. The weights 58 are designed to counterbalance the weight of the rod 52 and adjustable balls 54 arranged thereon. Consequently when the water in the cylinder 37 rises it will act upon the piston 53 and force the same upwardly. Necessarily the rod 52 and adjustable balls 54 arranged thereon will be moved upwardly. When the float 32 has reached the lower end of the cylinder 17, the water within the cylinders 5 and 37 will have risen in said cylinders to a plane just below the partition 13 in the cylinder 5. Just before the rod 52 reaches its upward limit of travel the lowermost ball 54 arranged thereon will engage on the under side of the bifurcated end 26 of the arm 25 and raise the same. This will reverse the position of the arm 27, and with said reverse movement the inlet-valve 21 will be closed and the exhaust-valve 21ª opened. As the steam exhausts through the valve 21ª, the water in the cylinder 5 will lower and displace the water within the hollow base 2. This action will necessarily force an amount of said water into the cylinder 17, and as said water in said cylinder 17 rises the float 32 will rise therewith. As soon as the air has been passed through the apertures 14, closed by the valves 15, said valves 15 will automatically close and the pressure on their tops will cause the same to remain in this closed position. The suction created as the water lowers in the lower end of the cylinder 5 will draw the valves 9 a slight distance downward and allow an inlet of air to the cylinder 5 below the partition 13. As soon as this reverse movement begins a certain amount of compressed air will pass through the connection 41 to the cylinder 37, and said compressed air will force the piston 53 on the lower end of the rod 52 downwardly. As the volume of water beneath said piston 53 cannot pass through the valve located at the lower end of said cylinder, it will discharge from said cylinder through the pipe 44 and check-valve 45 located therein. As said rod 52 returns to its lowermost limit of movement, the upper one of the adjustable balls 54 will engage the bifurcated end 26 of the arm 25 and reverse the position of said arm and of the arm 27. This will close the exhaust-valve 21ª and open the inlet-valve 21, and the operation heretofore described will be repeated. With said continued operation the air may be compressed, as desired, in the upper end of the cylinder 5, from whence it is distributed or used, as desired.

When water is used as a motive power, the float 32 and guide-rod 33 are dispensed with, and the admitted water acts directly upon the water within the cylinder 17. Thus said water within said cylinder forms a liquid piston.

The stroke of the compressor is regulated

by the adjustable balls 54 upon the rod 52, the speed of said compressor being regulated by the check-valve 45 in the pipe 44, as the water returning from the cylinder 37 passes through said check-valve 45 on its return to the hollow base 2.

The float 32 is used mainly to prevent the steam from coming in direct contact with the water, and said float is made of any suitable material that is a good non-conductor of heat.

Cold water is supplied through the connection 36 and prevents the water already within the compressor from becoming overheated.

A compressor of my improved construction is exceedingly simple, the friction in operating is reduced to a minimum, the steam or water used as a motive power is applied directly to a liquid piston, and it may be easily and expeditiously regulated in speed and capacity.

I claim—

1. In an air compressor, a hollow-base, a cylinder vertically arranged upon one end of and communicating with said base, a partition located transversely within said cylinder, check-valves arranged in said partition, air-inlets to said cylinder below said partition, a vertically arranged cylinder located upon the other end of and communicating with said hollow-base, inlet and exhaust valves communicating with the upper end of said last mentioned cylinder, a vertically arranged cylinder between the two hereinbefore mentioned cylinders, a ball-valve located at the lower end of said cylinder, an elbow connecting the upper end of said cylinder with the first mentioned cylinder above the partition therein, a vertically arranged rod operating within said last mentioned cylinder, a piston located on the lower end of said rod, and suitable connections from the upper end of said rod to alternately operate the inlet and exhaust valves on the second mentioned cylinder.

2. In an air compressor, a suitable hollow-base, a compression cylinder located upon one end of and communicating with said hollow-base, a partition located in said compression cylinder, check-valves located in said partition, air-inlets to said compression cylinder below said partition, suitable valves for said air-inlets, a piston cylinder located upon the other end of and communicating with the interior of the hollow-base, inlet and exhaust valves communicating with the top of said cylinder, a float arranged to move vertically within said piston-cylinder, a cylinder located between the two hereinbefore mentioned cylinders, the upper end of which communicates with the compression-cylinder above the partition therein, a suitable valve located in the lower end of said last mentioned cylinder, a tubular connection from said cylinder above the valve to the hollow-base, a check-valve located in said tubular connection, a rod arranged to move vertically in the upper end of said cylinder, a piston located on the lower end of said rod, weights connected by cords to said rod to counterbalance its weight, a rock-shaft mounted for rotation in bearings fixed upon the piston-cylinder, an arm fixed upon said rock-shaft that is loosely connected to and operated by the vertically moving rod, a second arm fixed upon said rock-shaft, and connecting-rods from the ends of said arm to the inlet and exhaust valves at the top of the piston-cylinder.

3. In an air compressor, a suitable hollow-base, a compression-cylinder, a piston-cylinder, inlet and exhaust valves communicating with the top of said piston-cylinder, a cylinder arranged between the two hereinbefore mentioned cylinders, a valve located in the bottom of said cylinder, tubular connections from the cylinder above said valve to the hollow-base, a check-valve located in said tubular connections, an elbow fixed to the top of said cylinder and communicating with the compression-cylinder, a rod arranged for vertical movement through the top of said last mentioned cylinder, a piston located on the lower end of said rod, balls arranged for vertical adjustment upon said rod, weights arranged to counterbalance the weight of said rod and balls, a rock-shaft mounted for rotation in bearings fixed to the top of the piston-cylinder, an arm fixed upon said rock-shaft, the forward end thereof being bifurcated and engaging upon the vertical rod between the adjustable balls, a second arm fixed upon said rock-shaft, and rods connecting the ends of said arm with the valve-stems of the inlet and exhaust valves at the top of the piston-cylinder.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST WITTMANN.

Witnesses:
EDWARD EVERETT LONGAN,
JOHN L. TUNISON.